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Animal Breeding Research Department

THE UNIVERSITY, EDINBURGH

REPORT OF THE DIRECTOR

For the Year April 1st. 1924 to March 31st. 1925.
(being the 5th Annual Report.)

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EDINBURGH UNIVERSITY AND THE EAST OF SCOTLAND
COLLEGE OF AGRICULTURE

Joint Committee on Research in Animal Breeding

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Professor J. A. Scott Watson, F.R.S.E.
William Young, Esq.

Director of the Animal Breeding Research Department,
F. A. E. Crew, M.D., D.Sc., Ph.D., F.R.S.E.

(During the course of the year Sir Edward Sharpey Schafer and Dr. Lauder resigned from the Committee. Professor Lorrain Smith became the Chairman, and Principal Shearer of the College of Agriculture took over the duties of Treasurer. Professor A. Cushny, F.R.S., was nominated by the University to fill the vacancy caused by the resignation of Sir Edward Sharpey Schafer).

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FIFTH ANNUAL REPORT

AN annual report is regarded by some as a challenge to the sceptical, as a justification for the existence of an institution. It is not for the professional biologist in the service of the State to justify him-:self in this way: it is not for him to argue that his employment must of necessity lead to the profit of the individual or of the State. The question of the value of such a man and of such an institution as this is one the statesman and economist must answer. The fact is that the State, under advice, considers that benefits of a practical kind to be shared by producer and consumer, may be expected to emerge from the ac-:tivities of such an institution as this. For our part we endeavour to respond to that confidence and to provide information that will, in the end, be useful in, and applicable to, the business of practical live-:stock breeding. But it must be stated that we dare not guarantee that anything we do can be used immediately in the improvement of flock man-:agement or in the business of animal breeding.

It is sometimes thought that organised research must inevitably lead to discovery of considerable magnitude and within a comparatively short period of time, and this notion leads to disappointment when dis-:covery is not soon forthcoming. A critic is apt to overlook the fact that a research staff consists not of geniuses but of quite ordinary folk who differ from others only in that they use implements, mental and material, that are not commonly employed by those engaged in dis-:similar occupations. A director of a research institution does not hope to find genius in himself or his staff:he seeks men with a marked degree of common sense which may be methodically employed in the col-:lection, co-ordination, comparison, and analysis of experiences. He recruits men who exhibit eager curiosity and fierce self-criticism, men who are capable of deductive and inductive reasoning, and who have a vivid yet disciplined imagination, and tries to create and to maintain an atmosphere in which these qualities flourish. He seeks to lead them in the adventurous collection of as many experiences as possible, in order that a clear demonstration of those circumstances in which diff-:erent variants occur may be obtained.

During the past year the Department has flourished and the staff has grown in intellectual strength. We are far more fitted to under-:take our task than we were a year ago. We do not deceive ourselves or try to deceive others, however, by suggesting, explicitly or implicitly,

that we hope to revolutionise stock-breeding practice. The Department is young, our science is young, we, unlike our colleagues in the re-:search institutes devoted to the elucidation of problems of nutrition or of disease, work in a field that has been cultivated by generations of keen and capable men; moreover, genetical argument is often render-:ed abortive by economical expedience.

In assessing the value of our work up to date regard must be paid to the size of our income, the numerical weakness of the staff, the time required for the larger animals to reach maturity, the cost of their maintenance, the high level of stock-breeding in this country, and fin-:ally the fact that until a few months ago all the ground we had was a city backyard. So far we have been forced by circumstances to work in a limited way with animals that in the opinion of the stockbreeder are not animals at all. But this is now all rapidly changing. The generous help of the University in providing laboratory accommodation and ground at King's Buildings, Liberton, has at last given us the opportunity of demonstrating our claim that since most of the qualities of the stock with which the breeder is concerned are hereditary characters, and since heredity and variation are at the basis of all the breeder's work it is essential that he shall secure knowledge of the manner in which these hereditary characters arise in a stock, are modified or are lost, and are transmitted in inheritance. We can hope that soon we may be in a position to demonstrate such biological facts as these; it will be for the breeder to examine the question as to whether or not such know-:ledge will benefit him financially: they most certainly will do so intellectually.

We wish to record again our gratitude to the governors of the Ed-:inburgh and East of Scotland College of Agriculture, to Professor R. G. White, of the Department of Agriculture, University College of North Wales, Bangor, and to Messrs. W. Johnston & Co., of Cowden, Comrie, Perthshire, for the help they have given to the Department in so read-:ily accommodating our sheep and poultry. Without their sympathy and assistance a great deal of the work we have been doing would have come to an end long ago.

Transfer of the Department to King's Buildings.

The Department was transferred from the old Infirmary Buildings at High School Yards in the centre of the city to the King's Buildings' site in December 1924. Sir James Walker placed six perfectly new lab-:oratories in his Department (Chemistry) at our disposal, and the Uni-:versity gave us free use of about seven acres of land adjoining. Only one who has worked in most unsuitable surroundings and who has tri-:ed to rear animals in the most impossible places can share our ap-:preciation of our present quarters. In addition to the ground

allotted to us by the University we rent the grazing rights of the large playing fields of the University Women's Athletic Club. This move to the King's Buildings' site, (which is about 2¼ miles from the General Post Office and Princes Street) marks the beginning of a far more active phase in the history of this Department. We must now seek endowment that shall allow us to make full use of these increased opportunities.

Changes in Staff.

Dr. G. F. Finlay, who spent a year on the staff, left in October 1924 to continue his survey of British farming before returning to Australia. It was understood that he was to be with us only for a year or so, but it was thought that to have so widely travelled and so well equipped a man with us even though for so short a time would be benef-:icial to us all. We all learned much from him and dare to think that he found his time with us a source of advantage. To fill his place Mr. J. A. Fraser Roberts was promoted, and to fill the vacant post Mr. A. W. Greenwood was appointed.

Exhibits.

The Department contributed an exhibit to the Agricultural Section of the Government Pavilion and one to the Royal Society exhibit of the British Empire Exhibition. The exhibits consisted of stuffed museum specimens illustrating the physiology of sex-differentiation and sex-reversal in the fowl; and photographs, microphotographs, and wool sam-:ples illustrating the work on wool improvement and hybridising exper-:iments with sheep.

Conference.

On July 7-12 the Scottish Cattle Breeding Conference took place. It was organised by Dr. G. F. Finlay, then a member of the staff of this Department, in co-operation with the chief British breed societies and with the support of the Board of Agriculture for Scotland, for the pur-:pose of bringing into contact the scientist and the practical cattle breeder. The cattle breeding interests of U.S.A., Canada, British East Africa, Rhodesia, Argentina, Ireland, and Norway were represented. Papers contributed by authorities in animal genetics, physiology, and economics, dealt with such vital problems as "Inheritance in Cattle", "Performance Standards and Progeny Tests", (L. J. Cole); "Relation between Genetics and Practical Cattle Breeding" (E. N. Wentworth); "The Inheritance of Milk and Beef Characters" (G. F. Finlay); "Sex-Deter-:mination and Sex-Differentiation in Cattle" (F. A. E. Crew); "The In-:terpretation of Milk Records" (H. G. Sanders); and others. In addition

to these, reviews of the more important cattle breeding experiments conducted in various countries were presented. The Conference was the first of its kind to be held in Great Britain and although the member-:ship was smaller than could be wished, those breeders who were present displayed great interest in the proceedings and took a very active part in the discussion. The papers presented at the Conference were col-:lected and edited by Dr. G. F. Finlay and have recently been published in book form.

Research Students.

An estimate of the value attached to the science of genetics and of the reputation of this Department can be gathered from a considera-:tion of the fact that the Department is attracting an increasing num-:ber of post-graduate students. The following post graduates working in this Department are proceeding to a research degree within the Uni-:versity.

Miss J. S. S. Blyth, Scotland.
Mr. A. W. Greenwood, Australia.
Dr. T. Marchlewski, Poland.
Mr. J. E. Nichols, England.
Mr. J. A. Fraser Roberts, Wales.
Mr. F. W. Sansome, Scotland.
Mr. Y. Tamura, Japan.
Mr. A. Walton, Scotland,
(transferred to Cambridge).

Dr. F. W. Dry, who at the University of Leeds is engaged in a gen-:etical study of colour in the Wensleydale sheep, has visited the De-:partment on several occasions in order to discuss the progress and the conduct of his investigation with members of the staff. It is most satisfactory that such association of workers in the same field should be possible.

Teaching.

Before there can be any real appreciation of the advantages that may follow the application in agricultural practice of genetical fact there must be an understanding on the part of the agricultural commun-:ity of what has been done and of what is being done by the biologist. It will not be until the agriculturist knows what genetics is that the geneticist will be provided with the facilities of doing more ambitious and possibly helpful work. It is impossible for us to travel far and wide talking of what we are doing, or what we hope to do; our business

is to stay here and do it. But it is possible for us to make contact with the students now passing through the agricultural schools and this we do, for courses of lectures in genetics are now included in the curricula of the agricultural and veterinary students at Edinburgh.

It is of the utmost importance that all students of agriculture should understand what genetics is and what genetical research is afoot. It is necessary, therefore, that students at Aberdeen and Glasgow as well as at Edinburgh should become acquainted with the subject, and arrangements have been made by which short lecture courses in genetics are given at Aberdeen and at Glasgow by members of the staff of this Department. A genetical survey of breeds and breeding practices cannot be restricted to Scotland. In order to know the sheep of Scotland it is necessary to know the sheep of other countries as well. Knowledge of the Merino, the Welsh, the Spanish, and so on, implies knowledge of the Blackface; the sheep is a species and not a breed. So our interests cross the Border. Mr. Fraser Roberts is working mainly with the Welsh sheep chiefly because Professor R. G. White of Bangor has placed at our disposal his pedigreed flock concerning which the most carefully kept records are available. Mr. Fraser Roberts gives a short course of lectures in genetics in relation to livestock breeding at Bangor. Mr. J. E. Nichols is mainly concerned with sheep problems of the Borders and is closely associated with the activities of Professor Gilchrist and his staff at Newcastle. It has been arranged that Mr Nichols shall give a short course of lectures to the students of Agriculture there. This recent development, made possible by the sympathetic understanding of the teaching staffs at these centres is regarded as one of the most important, for there can be no application of a science until that science is understood by the practitioner. The country may not be able to support more than one research institute in animal breeding, but it is essential that all agricultural students shall know of its existence and of the work it is doing.

The time may come when it will no longer be necessary to call the attention of the community to the bearing of the science of genetics on human affairs. At the present time, however, it is very necessary indeed to introduce the subject to as many organised sections of the community as possible. A considerable number of lectures are given in the course of a year and, as a result of these, much valuable material makes its way to the Department. If the morning post is heavy (over 3000 letters were received during the year), at least it is a manifest sign that we are in touch with a great number of people who are interested in our subject and in our doings. This Department is becoming recognised as the place to which to write for information concerning breeding problems. Most of the questions asked we cannot answer, but from our correspondence we are gaining an accurate knowledge of the most acute problems that confront the breeder, and some idea of the ways in which these problems may be investigated.

Five separate courses of lectures were given by Dr. Crew within the University of Edinburgh, viz.:

(a) To students of Veterinary Science.
(b) To students of Pure Science.
(c) To 3rd year students of Agriculture.
(d) To 1st year students of Agriculture and Forestry.
(e) To students of the post-graduate Medical School.

Mr. Montagu Drummond, Director of the Plant Breeding Station, Cor-:storphine, again took part in the course of lectures to students of Agriculture.

An outstanding feature of the activities of the Department during the past year were lectures and papers given to various societies, both scientific and agricultural. Judging by their number, they appear to become increasingly popular and there is a constant demand from all parts of the country. The list is as follows:

Edinburgh University Indian Association	Dr. Crew
Royal Institution, London (2)	"
Royal Society of Medicine, London	"
Scottish Women's Rural Institute	"
Edinburgh Natural History Society	"
British Association for the Advancement of Science, Toronto,	"
National Veterinary Medical Association, Glasgow	"
Midland Agricultural and Dairy College	"
Association of Economic Biologists, Cambridge	"
British Society for the Study of Sex Psychol-:ogy, London.	"
Edinburgh University Psychological Society	"
Liverpool University Biological Society	"
Edinburgh Pathological Club.	"
Lancaster Utility Poultry Society, Preston	"
Royal Medico-Chirurgical Society, Glasgow	"
St. Andrews University Biological Society	"
Glasgow Royal Philosophical Society	"
Oundle School	"
Rugby School.	"
Scottish Cattle Breeding Conference	Dr. Crew, Dr. Finlay
Agricultural Research Conference, Glasgow	Dr. Finlay
Cambridge University Agricultural Society	Mr. Roberts
Teviotdale Farmers' Club, Hawick.	"
Armstrong College Agricultural Society	Mr. Nichols
Society of Economic Biologists, Edinburgh	Miss Blyth, Mr. Green-:wood, Mr. Nichols.

Publications during the Year and Work in Progress.

F. A. E. CREW.

(1) Papers published:

Hermaphroditism in the Pig. (Jour. Obstet. & Gynaecol., 1924). Hermaphroditism is common in the pig and investigation has shown that the tendency to produce such abnormal individuals is hereditary. In order to explain the gradations of the condition that are encountered it is suggested that the ambivalent left gonad undergoes differentia-:tion before the posterior, the process passing as a wave from pole to pole. Further it is suggested that these abnormal individuals are gen-:otic males in which the relation between the male and female sex-det-:ermining factors is such that during the earlier part of differentia-:tion the female-determining reactions are in excess, but that later these are overtaken and replaced by the male sex-differentiating reac-:tions. The degree of abnormality is determined by the point during the phase of sexual differentiation at which one type of sex-differ-:entiating reactions is replaced by the other. Now that adequate accommodation has become available, it is hoped to carry out critical breeding work on this subject.

The Bulldog Calf. A Contribution to the Study of Achondroplasia. (Proc. Roy. Soc. Med., 1924). In certain breeds of cattle (and also of sheep), a certain proportion of the offspring are dead-born and de-:formed. The abnormalities are very similar to, if not identical with, those constituting the condition of achondroplasia in the human. In-:vestigation has shown that the condition is hereditary; that its mode of inheritance is fairly simple; and that the cause is a retardation in the time at which the pituitary comes into action during fœtal life. The study is being continued. Its real interest to the breeder is that it shows perfectly clearly that any characterisation, normal or abnor-:mal, that is transmitted in inheritance in accordance with the Mendel-:ian scheme is a character in the Mendelian sense and can only be fixed in, or eradicated from, a stock by the employment of Mendelian methods of breeding.

The Sex Ratio and the Question of its Control. (Intern. Rev. Agric., N.S., 1924). It is established that in the mammal the male is digametic, elaborating two forms of sperms, one which when fertilis-:ing an egg will yield a male, the other a female; and that in the bird it is the female that is digametic. This paper is a review of what is known concerning the agencies that effect the differential production and selective elimination of one of the forms of gametes elaborated by

the digametic sex. It also discusses the fact that it is the digametic sex among offspring that is eliminated before or shortly after birth under conditions that are unfavourable. The purpose of the paper was to bring up to date our knowledge of the sex-determining mechanism since any effort to control this mechanism demands a full knowledge of what this mechanism is. It is known that many agencies, X-rays, for example, affect the differential production of the two sorts of gametes and in-:vestigations dealing with this subject are now in progress.

(2) Work in Progress.

Comprehensive investigations into the phenomena of inheritance in the pigeon, rabbit, duck, and fowl are being continued. Arrangements are being made for similar studies in the goat, pig, and sheep. Further cases of sex-reversal in the fowl and duck are under observation. The mode of inheritance of deafness in the bull-terrier is being traced.

The creation and exploitation of increased opportunity for the De-:partment and for the rest of its staff is the main activity of a dir-:ector. Increased opportunity can only come with increased endowment and it is the director's business to help to attract this by securing first rate researchers, and by interpreting the results of their work to the community. We have failed so far to attract non-governmental endowment. This is understandable, for the solution of breeding prob-:lems is not so urgently demanded as is that of problems of disease or of nutrition. We hope, however, to attract such endowment, for recog-:nition of the value of genetical reinforcement to the craft of live-:stock breeding cannot be delayed much longer. We hope that soon some individual or organisation will give us the security that is so desir-:able.

J. A. Fraser ROBERTS

(1) Papers published:

Colour Inheritance in Sheep. I. Black Colour and Badger-Face Pat-:tern in Welsh Mountain Sheep. (Jour. Genet., 1924). Another year's experimental breeding has been carried out at the College Farm of the University College of North Wales. The results go to confirm what seemed probable from the first year's breeding, namely, that the badger-face pattern is a simple recessive, and black colour in Welsh sheep a simple dominant. F_2's will in each case be raised next season. The mating of a ram from a black × badger-face mating to badger-face ewes gave blacks, whites, and badger-faces in the expected proportions, in-:dicating that the relation of the black and the badger-face characters is one of epi- and hypostasis.

(2) Work in Progress:

Colour Inheritance in Sheep. A number of 'reversed' badger-face sheep have been secured; in these sheep the areas which are black in the ordinary badger-face are white, and vice versa.

In the case of the Spanish crosses a back cross of a black F_1 to white ewes gave half blacks and half whites. This result confirms the hypothesis previously advanced. It is hoped next season to complete the evidence by mating a Spanish F_1 ram to Spanish ewes. It would appear that this breed possesses yet another factor which distinguishes them from most other breeds, namely, a factor which turns the black coat at birth into a medium fawn in adult life. The fact that the F_1's remain black suggests that this character too may be simple in its mode of inheritance. In view of the extension of this work it is hoped to increase greatly the experimental flock at Bangor.

Peruvian Merino Scheme. During the year practically all the flocks where Peruvian Merino rams had been introduced were visited. Notes were taken and consultations took place with the various breeders as to the breeding programme for the current season. Samples were taken of the lambs' coats, both the pure-bred and crosses, and are being examined. Last shearing time the fleeces of the pure-bred animals were obtained, and next shearing time those of the cross-breds will be available. The crosses include Oxford Down, Shropshire, Ryeland, Halfbred, Welsh Mountain, Kerry Hill, Blackface, Dorset Horn, Derbyshire, Gritstone, and a few Piebald.

Studies on the Fleece of Welsh Mountain Sheep. In connection with the scheme outlined in previous reports a method has been developed for the estimation of the fleece from the breeder's point of view, using the score card method. Five points were selected, namely, Absence of Kemp, Length, Density, Absence of Lockiness, and Fineness. Marks are awarded for each point in the case of each fleece. A large number of sheep have been examined in this way by Professor R. G. White and Mr. R. N. Jones, Livestock Officer for Wales. Strong correlation was found to exist between the grades of the coat at birth and the various points which were in addition correlated to a greater or lesser extent with each other. The internal evidences of accuracy for these figures are very strong. This work constitutes a part of the comprehensive scheme which is in progress, but the figures open up other possibilities. They are an indication of the value of practical criteria, of the possibilities of their scientific interpretation, and of the possibilities of closely linking up such observations with the more strictly scientific data.

As regards the main scheme, it has become more and more possible to recognise definite types of fleece within the Welsh breed, and to

determine the limits of variation of each class of this sort. The time has arrived when definite genetical experiments can be initiated with the reasonable certainty that the characters selected are clear from a scientific point of view as well as being of practical importance or related in a definite way to such characteristics.

Colour Inheritance in Welsh Black Cattle. A number of herds, excellent private records of which have been kept, are being visited, There is every possibility that the inheritance of three characters not described previously and apparently simple in their mode of inheritance will be elucidated.

J. E. NICHOLS.

(1) Papers published:

Fertility in Sheep. (Jour. Minist. Agric., 1924). Data from 133 flocks for the season 1923-24 were collected for the purpose of investigating breed differences in fertility and obtaining information on the occurrence of barrenness and abortion in purebred flocks. The breeds from which data were obtained were Border Leicester, Leicester, Dorset Horn, Suffolk, Oxford Down, Lincoln, Southdown, Hampshire Down, Blackface, Kent or Romney Marsh, Cheviot, and Shropshire. Although the returns were fewer in number than it was hoped the records of 19,373 ewes were available for consideration, and the conclusions drawn from an analysis of the data were fairly representative of the breeds considered. The records were, however, insufficient to warrant classification according to district, altitude, and type of land.

The pure-bred flocks showed a total lambing percentage of 124.6 lambs per 100 ewes, the percentage of ewes bearing twins being 30.8 and of those bearing triplets 1.8; the total percentage of barren ewes was 3.4. It was found that fertility is influenced by those factors, hereditary and otherwise, that affect primarily the tendency to produce a high proportion of multiple births and a low proportion of barrenness, while there is apparently a correlation between barrenness and a low percentage of twins. Incidental records of 1,398 ewes crossed with rams of other breeds were available: these showed a lambing percentage of 136.6 and a percentage barrenness of 3.5. It was also possible to obtain figures showing the effect of 'flushing' the ewes before service, that is, of producing a high state of nutritive activity and an improved condition by means of additional feeding. The 1,775 ewes which had been flushed showed a lambing percentage of 149.5, and the conclusion that the practice of flushing has a beneficial effect on the yield of the lambs was supported by records of a single flock over a number of years, the yield of lambs during the flushed seasons being

129.9 per cent., and when not flushed 116.2 per cent.

It was also found that barrenness and abortion (apart from pathological causes) are largely due to environmental factors, but the importance of hereditary factors cannot be neglected. Data on the sex ratio of lambs gave this to be about 97 males per 100 females.

(2) Work in Progress:

Fertility and Fecundity in Sheep. In order to obtain evidence on the effect of environmental influences from season to season, the questionnaire distributed last year was again sent to those breeders who had made accurate returns, and if the data obtained for 1924-25 show significant differences, the investigation will be continued further. Meanwhile it has been possible to obtain data extending over the period 1911-24 for flocks of two breeds, Cheviot and Blackface, kept under identical conditions (hill) for the whole period of 14 years, By comparing these data with the metereological records for the same time, most suggestive associations between climatic conditions and fertility have been demonstrated, and also indications of differential response of the different breeds to climate. Thus it was found that the mean temperature at tupping time has a greater influence on the total yield of lambs than the mean temperature at lambing time; and that the latter has a greater influence in the case of the Cheviot than in the Blackface. Grouping together barren ewes, ewes which aborted, and those which after lambing were unable to nurse their lambs, it was found that the influence of mean temperature on the proportion of this group to the number of ewes put to the ram is greater in the Blackface than in the Cheviot, while there is a suggestion that the mean daily range of temperature at tupping time has an inverse effect on the total yield of lambs for both breeds. The data suggested that the number of rainy days and the rainfall in inches at lambing time are associated inversely with yield. It was also possible to draw the tentative conclusions (a) that climatic factors have no effect upon the sex-ratio as observed at castrating time; (b) that, apart from consideration of the climatic factors, in the flocks examined there is no relation between sex-ratio and yield of lambs per hundred ewes; and (c) that while there is no apparent association of infant mortality between the end of the lambing season and castrating time with the ultimate sex-ratio, this does not exclude the possibility of a selective mortality of the sexes.

Inheritance in Halfbred Sheep. The cross between Border Leicester and Cheviot sheep known as 'Halfbred' is often maintained to breed to a uniform type and therefore to defy Mendelian laws of inheritance. To dispute this statement it is necessary to produce evidence of segregation into parental types in the second generation of the cross. A flock of Halfbred ewes which were mated to Halfbred rams was available for examination, the ewes were of two types, North Country Halfbreds

(from Sutherland Cheviots × Border Leicester rams), and South Country Halfbreds (from Border Cheviots × Border Leicester rams); though each type had been selected for uniformity considerable variation in fleece characters was observed, the range being from an approximation to the Cheviot type of fleece to an approximation to the Border Leicester type. The lambs in season 1924 even in their early days showed considerable variation in type; when the wether lambs were carefully examined at the end of July 1924 before being drafted for sale and the gimmer lambs in the spring of 1925, it was found that they could be classified according to four well marked types. Type A were 'Halfbred' in body conformation and fleece characters; type B essentially of Border Leicester characteristics; type C of Cheviot characteristics; and type D a mixed class including lambs with Border Leicester fleeces on Cheviot conformation, Cheviot fleeces on a Border Leicester conformation, and a few intermediates. Of a total of 103 wether lambs the distribution was type A 64; type B 18; type C 1; type D 20 (with one approaching type C). These figures show that a definite segregation does occur in the second generation of the Border Leicester × Cheviot cross.

Samples of the fleece were taken from the Halfbred ewes and also from the various classes of the gimmer lambs; analysis of these samples by a method similar to that used in the Welsh Mountain sheep investigation is being carried out. The results so far show that in addition to the wide range of variation observable on gross inspection, significant variations occur in the proportion of the different type of fibres present.

Studies on the Fleece of Suffolk Sheep. The quality of the wool of the Suffolk sheep is impaired by the fact that pigmented fibres are present throughout the fleece. The distribution of such fibres varies considerably in area and total amount, but they are usually to be found in certain definite regions, as on the neck (particularly the under side), on the 'tail-head' area, and towards the extreme area of extension of the fleece on the legs. It is the aim of Suffolk breeders to eliminate these dark fibres while preserving the intensity of pigmentation of the face and legs. Purebred Suffolk lambs are born with dark pigmented coats, the intensity of pigmentation being variable, and gradually the coat becomes lighter as the adult fleece develops. It was decided to determine whether any correlation existed between lambs' coats and distribution of dark fibres in adult fleeces. As a preliminary investigation a number of lambs in pedigree Suffolk flocks are being observed from infancy to adolescence, the changes in coat colouration and of face pigmentation being judged at intervals by means of comparison with a decimally graded scale of colours ranging from black through a warm brown-black to a light creamy grey. Wool samples of the lambs' sires and dams and from the lambs themselves when the change is complete will be taken and the proportion by weight of dark fibres present determined.

The changes in colouration so far recorded afford interesting indica-:tions that the method used should lead to valuable results.

J. S. S. BLYTH.

(2) Work in Progress:

Southdown × Blackface Experiment. In selecting lambs in autumn which were to be retained for further breeding, rigid culling was car-:ried out among the ewe lambs, only half (ten) being kept; as expected earlier in the year, the chief disqualification among those rejected was brown colour in the fleece. Of the ram lambs all but the three which appeared to be nearest to the desired type were castrated.

In order to obtain a better F_1 ram, a dozen Blackface ewes (placed at our disposal by the Edinburgh and East of Scotland College of Agric-:ulture) were crossed with one of the Southdown tups originally used in the experiment. Of the F_1 lambs thus obtained, three tup lambs were retained, the rest sold. Four of the latter went to a neighbouring farmer (Mr. Graham, Crosshouse), who won the reserve championship in the autumn carcase competition at the Scottish National Fat Stock Show with one of them. In the sale afterwards it topped the list, selling at 2/9 per lb., while the champion came next at 1/10 per lb. Prices obtained for cast crossbred lambs during the year compared very satis-:factorily with those of Blackface sheep running alongside them. The wool clip from the first cross was also good, averaging over $5\frac{1}{2}$ lbs.

It was originally intended to use two of the F_1 type lambs in au-:tumn instead of the F_1 ram used the previous year, but an F_1 tup of good type was purchased later from the flock of Sir John Ramsden at Kingussie, and was mated with the F_1 ewes in their stead. He has proved a good breeder, and has left a large crop of lambs. Detailed examination of these has not yet been made, but they appear distinctly superior to last year's crop, both as regards conformation and fleece.

Micrological Investigation. The micrological survey of wools from various British breeds of sheep has been completed. Samples from some twenty breeds have been analysed and a general view of the situa-:tion has been obtained. The British breeds of sheep are capable of classification according to the types of fibres present in the fleece and their disposition into the following four groups: Mountain Longwool breeds, Lustre breed (comprising the other Longwools), Mountain Short Wool breeds, and Short Wools (including Down breeds).

The results may be summarised as follows: (1) There occur in Brit-:ish breeds of sheep two main types of fibres. Type I is proportional-:ly the longer and coarser, and exhibits characteristic reticular scale

markings. It appears to occur only in the Lustre and the Mountain Longwool groups of breeds. Type II is shorter and finer and possesses a coronal type of scale marking; it occurs in all breed groups. It constitutes the main type in the Short Wools, and is present in varying proportions in the Mountain Longwools and the Lustres. In some samples of the latter group, however, its component fibres are very few in number. (2) Two small subsidiary classes of fibres are also found. Kemp, the coarsest type, is present in all breeds. It is shorter than the main types and is shed periodically, being usually found lying loosely in the fleece with a complete tip and root. The other small group consists of very fine short fibres, similar in structure to the finest members of type II. They were identified in only a few of the samples, but it is possible that they were present in all breeds, but were not separable from type II. (3) Type I and kemp are considered to be homologous with the hair of the primitive breeds of sheep, while the primitive wool is represented in modern breeds by type II and the small group of fine fibres. (4) Medulla varies greatly even with individual breeds. It has a greater tendency to appear in the homo-:logues of primitive hair than in those of wool, and occurs in mountain wools to a greater extent than in non-mountain. It is suggested that some of the variability of medulla is due to environment.

The results of this investigation have been embodied in a thesis presented to the University of Edinburgh.

A. W. GREENWOOD.

(1) Papers published:

Growth Rate in Hypophysectomised Salamander Larvae. Brit. Jour. Exp. Biol., 1924. In Amphibia it has been shown by Smith and Allen that the early ablation of the hypophysis anlage in frog embryos re-:sults in a diminished growth rate of the body as a whole and a retard-:ation in the development of thyroid. As it was not clear in how far the former effect was independent of the latter, the present experiment was undertaken. The pituitary gland was removed from a number of ax-:olotls ranging in age from six months to one year. It was shown that the ablation of the pituitary at an age when the thyroid has developed does not produce any significant alteration in the growth rate.

Gonad Grafts in Embryonic Chicks and their Relation to Sexual Differentiation. Ibid., 1925. Histological examination of the re-:productive tissue grafted on to the chorioallantoic membrane of the developing chick at the seventh day of incubation was carried out at the seventeenth day. It was found that many of the grafts had estab-:lished vascular connection and were growing. The process of sexual

differentiation of the developing chick was not affected by the presence of the graft. These results lend no confirmation to the work of Minoura who attributed to the gonad graft the production of a sex hormone capable of profoundly modifying the processes of normal sex-differentiation in the host embryos, leading to the production of intersexual forms. The work of Minoura was held to support Lillie's theory concerning the occurrence of the free-martin in cattle. However, in the present series the condition obtaining in the bovine free-martin is not experimentally reproduced, in that the embryo is exposed to the specific action of the grafted gonad alone, whereas in the free-martin the female co-twin is influenced by the action of all the internal secretions from the male.

(2) Work in Progress:

Gonad Grafts in Fowls. Histological examination was made of gonad grafts from a series of fowls operated on by Dr. G. F. Finlay. It was found that extensive structural changes occur in the grafted tissue after its persistence for a considerable period in another body. While some of the ovary grafts remain typically ovarian in structure, many show extensive changes due to a secondary proliferation of sex cords and their further differentiation into tubules of a definitely spermatic type. Most of the testis grafts, internal or subcutaneous, are either in active spermatogenesis or are composed of active and atrophic tubules. The removal of the ovary in the female sometimes results in the activation of the normally rudimentary right gonad. Two cases of such activation were found among the present series. One was typically testicular in structure, while the other was typically ovarian with a secondary invasion of sex cords and their differentiated products, tubules. The presence of definite female sex elements in the activated right gonad has not been previously described. The hypothesis is put forward that the right gonad is fundamentally female in constitution and, if it differentiated under a specific stimulus normally characteristic of the female chick at an early stage of incubation, only an ovary would be formed. Exceptional reproduction of these conditions at a post embryonic stage would account for the ovarian structure of the right gonad described above.

T. MARCHLEWSKI.

(2) Work in Progress:

Craniological Studies on Dogs. The study of phylogeny of domesticated animals, their relationship to the corresponding wild forms, has a direct bearing upon the problem of the origin of species. While the paleontologist deals with extinct and fossil forms that can be

merely described and perhaps furnish ground for more or less justified speculation, it is possible to use as material living organisms, some of which demonstrate astonishing resemblance to forms regarded as ex-:tinct, and show only slight variation under the influence of the agenc-:ies brought about by domestication. The possibility of introducing experimental genetical methods where systematic description has said its last word, offers one an opportunity of not merely describing but of explaining the process of evolution. For the study of variation and the relationship between the wild and the corresponding domesticated forms, it is necessary to have an exact knowledge of the skeletal and cranial features of the various domesticated breeds. Further, an accurate study of the range of variation of cranial features within a given pure breed is essential as a basis for standardising in cross-breeding experiments.

The dog was selected as experimental material on account of the great diversity of forms in this species. The following results were obtained from craniological studies. The form and rate of development of the skull is not entirely determined by the size of the animal; apart from certain conditions which appear to stand in a physiological relation with size of the animal, there exist other features which de-:termine the breed type, and which are genetic in nature. Further, it was observed that in related breeds the skulls, though exhibiting a similar mode of development, differ slightly in corresponding regions and this variation, though somewhat overlapping, is nevertheless typical for the respective groups. Finally, as no apparent correlation was observed between brachycephaly and an achondroplasia-like condition in the dog, a Bulldog bitch was mated to a Dachshund in order to put the matter to an experimental test.

Craniological Studies on Cattle. In the course of an investiga-:tion on the phylogeny of the British breeds of cattle, the suggestion was put forward that the Hereford, like some other British breeds, is systematically related to the North African variety of Bos primigenius, namely, B. primigenius Hahni. Examination of polled breeds leads to the conclusion that hornlessness, at least in the Aberdeen-Angus, is not a character of evolutionary or taxonomic importance.

Albinism in the Rabbit. Some recent investigators have recorded the fact that in the Himalayan rabbit, under certain environmental con-:ditions pigment may develop in regions which are normally white. As this fact appears to offer an opportunity for an experimental enquiry into the nature of genetic action, it was thought desirable to invest-:igate this problem by means of tracing the behaviour of the so-called 'Himalayan albinism' in crosses, and also by observing the mode of re-:action on the part of various breeds and their crosses with the Him-:alayan in response to those experimental stimuli, e.g., low temperat-:ure which cause excessive production of pigment in the skin of the

Himalayan. A comprehensive scheme has been devised and the following matings carried out:

Himalayan (incomplete albinism)	×	Albino (complete albinism)
"	×	Chinchilla (dilute allelomorph to self-colour)
"	×	Self-colour
"	×	English (epistatic piebaldness)

Y. TAMURA.

(2) Work in Progress:

Sex-Dimorphism of the Suprarenal Gland. According to Masui and Tamura, the size of the suprarenal gland differs markedly in the two sexes, it being considerably larger in the female than in the male. This difference is due to the degree of development of the zona reticularis. In very young individuals the zona reticularis develops in both sexes; in the female it increases gradually, while in the male it disappears prior to sexual maturity, only a few degenerate cells being left. In old females it disappears almost entirely, assuming the same structure as that of the male. In castrated males the suprarenal is larger than in the normal. This enlargement is due not to an increase in the bulk of the component tissues but to the appearance of a zona reticularis, while the medulla becomes slightly diminished. The growth of zona reticularis is so striking that it becomes almost similar to that in the suprarenal of a normal female. As a result of ovariotomy in the fe-:male no structural changes occur, the zona reticularis remaining nor-:mal. According to these facts it can be assumed that there exists a sex-dimorphism of the suprarenal. Experiments were carried out in order to determine what causes the disappearance of the zona reticularis in the male prior to sexual maturity and its reappearance after castra-:tion.

Individuals of both sexes were gonadectomised (castrated or spay-:ed at three weeks; at eight weeks they received implants of the gonad (sex-gland) of the opposite sex taken from individuals of the same lit-:ter. As was expected, the results of this experiment were negative; this is in agreement with the results of Moore and several other in-:vestigators. Testicular grafts disappeared after 4-5 weeks; ovarian grafts, though remaining, degenerated, so that no influence was effected on the suprarenal. In the second series of experiments the isolation

of the testis was effected by means of removal of the deferent duct; of the epididymis and deferent duct; or ligation of the deferent duct. It was thought that the isolation of the testis would have some bearing on the transplantation of the testis in the male. The experiments are not yet completed, but it can be stated that, as the result of the removal of the epididymis and deferent duct, there occur structural changes in the suprarenal which are somewhat similar to those following castration, though the structure of the suprarenal in these cases is not identical with that of castrated males. It is thought that injection of testicular extract into gonadectomised and immature males will help in the elucidation of the problem.

Sex-dimorphism of the Suprarenal. Experiments are now in progress which have for their object the problem as to whether there exists in the fowl sex-dimorphism of the suprarenal, as is the case in mammals (mouse).

Sterility. A Dingo bitch was received from Mr. T. H. Gillespie the Director of the Scottish Zoological Park. It was stated that she was sterile on account of the high degree of inbreeding. The external reproductive organs were of the normal female type, and four pairs of normal teats were present. On post-mortem examination, small irregularly shaped ovaries were found, one on each side; the follicles were visible with the naked eye. The uterus and vagina were infantile, the Fallopian tube adherent, so that there was no connection between ovary and uterus. The thyroid was found to be enormously enlarged and lighter in colour than normal. On histological examination the gonads were found to have retained the structure typical of an ovary although the peripheral region was composed of rather a deep layer of fibrous tissue in which a few atretic and cystic follicles were present. The structure below this contained many small and a few large follicles most of them were in various stages of atresia. In examining sections of the thyroid, only three small, comparatively normal, vesicles were found, the remaining being all in more or less advanced stages of degeneration. The suprarenals were also shrunken; the zona glomerulosa invaded in some parts the zona faciculata which was normal. In the zona reticularis the cytoplasm had vacuolated, and in some parts this zona was almost absent. The medulla had diminished. In the pituitary here and there white patches with a black speck were visible; under high magnification these were seen to be composed of thin threads of connective tissue and a degenerate nucleus.

It is seen from the above description that every endocrine organ, including the ovary, had degenerated, whilst the external genitalia were normal. Since this was the only case examined, it is impossible to determine whether or not these facts are caused by inbreeding. In order to find an answer to this question, it is necessary to examine sterile

individuals both from inbred and ordinary stock.

A. WALTON.

(2) Work in Progress:

Fertilisation. Work was continued on the physico-chemical pro-:perties of the spermatozoon, with a view to studying its behaviour under conditions analogous to those obtaining in the reproductive or-:gans. A point of particular importance raised was the agglutination of the spermatozoa by various substances, notably acids. As an acid condition of the uterus following contagious abortion is frequently cited as causing infertility, it was essential to investigate this ac-:tion in detail on material which could be obtained in an amount suff-:icient to allow quantitative experimentation. It was, therefore, found necessary to make use of the sea-urchin Echinus from which sexual cells can be obtained in large numbers. Through the courtesy of the Marine Biological Association and Dr. E. J. Allen, Director of the Laboratory, accommodation was obtained at Plymouth. The British Association gen-:erously granted the privilege of the Association Table.

It was found that agglutination by acid was accompanied by, or causally related to, a reduction of membrane potential below a certain critical value. The action of neutral salts and egg extractives were also shown to play a part in this reaction. The results of this in-:vestigation were published in the British Journal of Experimental Bio-:logy, 1924.

LIST OF PAPERS PUBLISHED, 1924-1925.

CREW, F. A. E.

The Bulldog Calf: A Contribution to the Study of Achondroplasia. Proc. Roy. Soc. Med., 17, pp. 39-58, 1924.

Hermaphroditism in the Pig. Jour. Obstet. & Gynaecol., 31, pp. 3-20, 1924.

The Sex-Ratio and the Question of its Control. Intern. Rev. Agric., N.S., 2, pp. 554-570, 1924.

Blue and White Colour in Swine. Jour. Hered., 15, pp. 395-396, 1924.

Science and the Breeder. Poultry Year Book, pp. 22-26, 1924.

Sex-linked Inheritance. Nat. Util. Poult. Soc. Year Book, pp. 89-92, 1925.

Notes on the Genetical Aspects of Fertility and the Sex-Ratio, Brit. Goat Soc Year Book, pp. 117-121, 1925.

FINLAY, G. F.

Recent Developments in Cattle Breeding. 62 pp., Oliver & Boyd, 1924.

GREENWOOD, A. W.

The Growth Rate in Hypophysectomised Salamander Larvae. Brit. Jour. Exp. Biol., 2, pp. 75-78. 1924.

Gonad Grafts in Embryonic Chicks and their Relation to Sexual Differentiation. Ibid., pp. 165-187, 1925.

ROBERTS, J. A. Fraser,

Colour Inheritance in Sheep. I. Black Colour and Badger-face Pat-:tern in Welsh Mountain Sheep. Jour. Genet., 14, pp. 367-374, 1924.

The Science of Genetics and the Stock-breeder, Welsh Jour. Agric., 1, pp. 38-42, 1924.

NICHOLS, J. E.

Fertility in Sheep. Jour. Minist. Agric., 31, pp. 3-9, 1924.

SMITH, A. D. B.

Shorthorn Colours. Jour. Hered., 16, pp. 73-84, 1925.

WALTON, A.

Studies on the Physiology of Reproduction. I. The Flocculation of Sperm Suspensions in Relation to Surface Charge. Brit. Jour. Exp. Biol., 2, pp. 13-20, 1925.

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